CLAIMS:

1. An electrolytic cell for electrochemically reducing metal oxide powders and/or pellets (as described herein) includes: (a) a bath of a molten electrolyte, (b) a cathode in the form of a member, such as a plate, having an upper surface for supporting metal oxide powders and/or pellets that is horizontally disposed or slightly inclined and has a forward end and a rearward end and is immersed in the electrolyte bath, (c) a cathode support means for supporting the cathode from above the electrolyte bath and for moving the cathode in the cell so as to cause metal oxide powders and/or pellets on the upper surface of the cathode to move toward the forward end of the cathode while in contact with molten electrolyte whereby electrochemical reduction of the metal oxide can occur as the powders and/or pellets move toward the forward end, (d) a plurality of anodes extending into the electrolyte bath, (e) an anode support means for supporting the anodes from above the electrolyte bath, (f) a means for applying a potential across the anodes and the cathode, (g) a means for supplying metal oxide powders and/or pellets to the electrolyte bath so that the metal oxide powders and/or pellets can deposit onto the upper surface of the cathode, and (h) a means for removing at least partially electrochemically reduced metal oxides from the electrolyte bath.

2. The cell defined in claim 1 wherein the anodes are arranged in a plurality of pairs above the upper surface of the cathode.

3. The cell defined in claim 2 wherein there is a plurality of the pairs of anodes along the length of the upper surface of the cathode.

4. The cell defined in claim 2 or claim 3 wherein

each anode is in the form of a block of a suitable anode material, such as graphite, mounted on the end of a rod.

5. The cell defined in claim 4 wherein the anode support means includes a fixed structure and a means for holding the anode rods to the structure above the electrolyte bath.

6. The cell defined in claim 5 wherein the means for holding the anode rods enables adjustment of the anode blocks vertically upwardly or downwardly so that the spacing of the ends of the anode blocks above the upper surface of the cathode can be varied.

7. The cell defined in any one of the preceding claims wherein the cathode support means includes:

(a) a plurality of cathode support members, such as rods, extending upwardly from the cathode,

(b) a fixed structure,

(c) a movable structure supported by the fixed structure and movable with respect to the fixed structure, the movable structure including a means for holding the cathode support members so that the cathode is immersed in the electrolyte bath, and

(d) a means coupled to the movable structure for moving the movable structure to thereby move the cathode in the cell so as to cause metal oxide powders and/or pellets on the upper surface of the cathode to move toward the forward end of the cathode.

8. The cell defined in claim 7 wherein the fixed structure of the anode support means is mounted to the fixed structure of the cathode support means.

9. The cell defined in claim 7 or claim 8 wherein the means for holding the cathode support members allows adjustment of the position of the cathode vertically upwardly or downwardly within the electrolyte bath.

10. The cell defined in any one of claims 7 to 9 wherein the cathode support means is adapted to move the cathode in the cell to cause metal oxide powders and/or pellets on the upper surface of the cathode member to move over the upper surface of the cathode in forward and rearward directions.

11. The cell defined in any one of the preceding claims wherein the cathode is formed to cause metal oxide powders and/or pellets to move on the upper surface of the cathode toward the forward end of the cathode as a packed mono-layer of powders and/or pellets.

12. The cell defined in any one of the preceding claims wherein the metal oxide is titania and the electrolyte is a $CaCl_2$-based electrolyte that includes CaO as one of the constituents.

13. The cell defined in any one of the preceding claims wherein the particle size of the powders and/or pellets is in the range of 1-4 mm.

14. A process for electrochemically reducing metal oxide pellets, such as titania pellets, in the electrolytic cell defined in any one of the preceding claims includes the steps of: (a) applying a cell potential across the anodes and the cathode that is capable of electrochemically reducing metal oxide supplied

to the molten electrolyte bath, (b) continuously or semi-continuously feeding metal oxide powders and/or pellets into the molten electrolyte bath so that the pellets deposit on an upper surface of the cathode, (c) causing metal oxide powders and/or pellets to move over the upper surface of the cathode toward the forward end of the cathode while in contact with molten electrolyte whereby electrochemical reduction of the metal oxide occurs as the powders and/or pellets move toward the forward end, and (d) continuously or semi-continuously removing at least partially electrochemically reduced metal oxide powders and/or pellets from the molten electrolyte bath.

15. The process defined in claim 14 wherein step (b) includes feeding the metal oxide powders and/or pellets into the molten electrolyte bath so that the powders and/or pellets form a mono-layer on an upper surface of the cathode.

16. The process defined in claim 14 or claim 15 wherein step (c) includes causing metal oxide powders and/or pellets to move on the upper surface of the cathode toward the forward end of the cathode as a packed mono-layer of powders and/or pellets.

17. The process defined in claim 16 wherein step (c) includes selectively moving the cathode so as to cause metal oxide powders and/or pellets on the upper surface of the cathode to move toward the forward end of the cathode.

18. The process defined in claim 17 wherein step (c) includes moving the cathode so as to cause powders and/or pellets across the width of the cathode to move at the same rate so that the powders and/or pellets have substantially the same residence time within the bath.

19. The process defined in any one of claims 13 to 18

includes applying a cell potential above a decomposition potential of at least one constituent of the electrolyte so that there are cations of a metal other than that of the cathode metal oxide in the electrolyte.